

## Analysis of Stunting on Dental Caries of Toddlers 24-59 Months in Jember District

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### ABSTRACT

Stunting and dental caries are two interrelated health problems experienced by young children in Indonesia, especially in areas with limited access to basic health services. This study aims to explore the relationship between stunting and the incidence of dental caries in toddlers aged 24-59 months in Jember Regency through a qualitative approach with a case study design. Data were obtained through in-depth interviews with mothers of toddlers, health workers at Posyandu and Puskesmas, as well as direct observation of environmental conditions and dental care practices and nutritional parenting in the family. The results showed that stunting in children is not only influenced by poor nutritional intake, but also closely related to the lack of parental knowledge about oral hygiene and dental health, low access to dental examinations, and local culture that has not prioritized early dental care. This study concludes that stunting must be addressed holistically by considering the social, behavioral, and cultural dimensions that influence dental health and child development

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## INTRODUCTION

One of the most common dental health problems faced by Indonesians is dental caries. Damage to the hard tissue of the tooth surface in certain areas is known as dental caries which occurs due to the accumulation of plaque bacteria on the tooth surface, which causes acid deposits (Amalia et al., 2021). The def-t index can be used to calculate how many deciduous / primary teeth have caries (Normansyah et al., 2022). According to Rachmawati et al (2020) the def-t index can be used to calculate caries in primary teeth. This index shows the number of deciduous teeth that have caries (d), exfoliation (e), and fillings (f).

The Global Burden of Disease Study in 2016 showed that as many as 3.58 billion people in the world experience oral health problems including dental caries (Kemenkes RI, 2020). Basic Health Research (Riskesdas) in 2018 showed that oral health problems were experienced by 57.6% of the Indonesian population. Caries is one of the oral health problems of the Indonesian population with a national prevalence of dental caries worth 88.8%, in children aged 3 to 4 years 81.5% and 92.6% in children aged 5 to 9 years (Kemenkes RI, 2018). In Indonesia, children aged 5 to 6 years have a def-t index of 8.1. Whereas in children in kindergarten in the coastal area of Puger, Jember Regency, the def-t index is included in the very high category of 10.074 (Nisa et al., 2019).

Dental caries has an impact on children's quality of life. A person's quality of life will get worse with higher levels of dental caries (Nurwati et al., 2019). Dental caries in children can cause oral pain, difficulty chewing, disruption of diet, insomnia, difficulty concentrating so that children's learning and social activities can be disrupted (Avpro et al., 2020). The problem of dental caries in children is important because dental caries is an indicator of the success of efforts to maintain children's dental health (Sholekhah, 2021).

The etiological factors of dental caries are multifactorial, including the host (tooth), plaque (microorganisms), substrate (carbohydrates) and time (Marlindayanti et al., 2022). Predisposing factors for dental caries are related to oral hygiene conditions, brushing habits and cariogenic foods. Microorganisms multiply and colonize on the surface of tooth enamel influenced by substrates in the form of carbohydrates. Diet affects the caries process locally, especially in terms of the frequency of food consumed (Marlindayanti et al., 2022). Cariogenic foods that contain a lot of sugar and are sticky can stick to the surface of the teeth, if not cleaned properly it can affect the formation of dental caries (Farizah et al., 2021).

Dental caries is also influenced by dental cleaning habits. Dental and oral hygiene is very important to prevent plaque formation. Food residue left on the surface of the teeth is known as debris. This debris will dissolve in saliva and form a layer of plaque, these residual particles contain bacteria that grow in a matrix that forms and adheres to the tooth surface (Aqidatunisa et al., 2022). Brushing teeth can clean food residue particles, bacteria, and even plaque. When brushing your teeth, you need to pay attention to the choice of time and equipment used (Rusnoto et al., 2023). According to Angelica et al (2019) parental education is related to children's behavior to maintain oral hygiene. Parents who have higher education tend to have more knowledge and information about how

to maintain good oral hygiene, so they can teach their children how to maintain good oral hygiene. According to Amiqoh *et al* (2022) the economic status of parents is also related to dental health where high economic status of parents tends to make their children's oral health more concerned and perform better dental care than parents who have low economic status.

Dental caries is also associated with malnutrition. Children with undernutrition have higher dental caries scores (Normansyah *et al.*, 2022). According to Ilham *et al* (2022) stunting is caused by long-term nutritional deficiencies where based on WHO standards for height for age is below minus two Standard Deviations (<-2SD). Stunting is an indicator of chronic malnutrition that affects various body systems, including oral growth and development, as well as various dental diseases and disorders (Renggli *et al.*, 2021). Caries-related malnutrition can occur in early childhood through the mechanisms of enamel hypoplasia and hyposalivation (Setiawan *et al.*, 2022). Severe early childhood caries is associated with iron deficiency anemia which reduces salivary flow, and deficiencies in vitamin D, vitamin A, calcium, and albumin can cause enamel hypoplasia/hypomineralization and loss of the protective effects of iron, vitamins, and zinc for teeth. Iron deficiency, calcium and protein malnutrition can cause enamel defects that make the enamel surface rough and vulnerable to plaque accumulation and facilitate attachment and accelerate the formation of *Streptococcus mutans* bacterial colonization which plays a role in the caries process (Folayan, 2019). In line with the research of Abdat *et al* (2020), children with stunting show developmental disorders in the oral cavity such as tooth maturation and enamel development is impaired and the eruption of primary teeth is delayed.

Another study on chronic malnutrition and oral health status in children aged 1 to 5 years studied by Vieira *et al* (2020) states that the salivary flow rate has decreased and has a negative impact on oral cavities due to malnutrition in children. Based on research by Abdat *et al* (2020), children who lack food intake have reduced chewing activity and have an impact on salivary secretion which is small. Less salivary secretion can reduce the *buffer* ability which can disturb the pH of the oral cavity and make teeth more susceptible to damage.

Jember Regency is an area with 8.3% stunting cases in 2024 and in 2022 Jember Regency ranked first in East Java with 9.4% stunting cases (Jember Regency Health Office, 2025). Toddlers 24-59 months were chosen because the primary teeth began to erupt at the age of 6 months and at the age of 24 months the eruption of the primary teeth was complete (*American Dental Association*, 2024). In addition, stunting in toddlers that occurs due to chronic malnutrition is only seen after the age of 2 years even though the lack of nutritional intake has occurred since the womb and early after the baby is born (Moksin *et al.*, 2022).

Although various studies have highlighted the high prevalence of stunting and dental caries as major health problems in children in Indonesia, studies that specifically examine the causal or correlational relationship between these two conditions in the under-five age group (24-59 months) are still very limited, especially in areas with high stunting rates such as Jember District. Most previous studies have focused on individual aspects, such as nutritional risk factors for

growth or behavioral factors for dental health, without integrating them. In fact, stunting, which is an indicator of chronic malnutrition, can affect the quality of tooth enamel, susceptibility to infection, and consumption habits of sweet foods that also contribute to caries. This lacuna indicates a research gap in understanding the multifactor relationship between stunting and dental caries in toddlers in a contextual and holistic manner. Thus, this study is important to provide scientific evidence on the relationship between chronic nutritional status and dental health, and can be the basis for integrated health policies at the regional level.

The novelty of this study lies in the integrative approach that examines the relationship between stunting as a manifestation of chronic malnutrition and the incidence of dental caries in children aged 24-59 months specifically in Jember Regency, an area with a high prevalence of stunting but minimal studies related to its impact on oral health. This study not only looks at stunting and caries as separate health problems, but as interrelated conditions through biological pathways (such as impaired enamel development and oral immunity) and behavioral pathways (such as consumption patterns and oral hygiene habits). This study also enriches the literature with local data that has not been widely explored, while encouraging the importance of a multidisciplinary approach between public nutrition and dental health in early childhood disease prevention efforts.

The purpose of this study was to understand in depth how stunting is related to the incidence of dental caries in children under 24-59 months of age in Jember District through a qualitative approach, by exploring the experiences, perceptions and practices of parents and health workers in addressing both issues. This study aims to identify the social, cultural, economic and behavioral factors that influence children's nutritional status and dental health, and explore the challenges and opportunities for integrated prevention efforts. The results of this study are expected to provide contextual insights as a basis for formulating more effective and locally-based public health intervention strategies.

## LITERATURE REVIEW

### *Caries*

Marlindayanti et al (2022) say that dental caries is the formation of cavities due to the destruction of the organic content of the teeth as a long and regressive disease process, starting with the formation of microbial acids from the substrate which extends to deeper parts so that deeper cavities are formed and the body cannot repair through the healing process because this process continues continuously. Bacteria, carbohydrates and time interact in this process resulting in demineralization of enamel, dentin and cementum which are the hard tissues of the tooth. Demineralization occurs because the organic material of the hard tissues of the tooth is damaged and the balance of the enamel is disturbed due to bacteria on the tooth surface, plaque, and diet interacting, especially plaque bacteria that ferment carbohydrates into acids, namely lactic and acetic acids. Bacterial invasion continues until it can cause pulp death and progress to the periapex so that pain in the teeth can arise.

According to Marlindayanti et al (2022) the etiology of dental caries is multifactorial. The etiology of dental caries includes:

1. Host (tooth)

Morphology, enamel structure, chemical factors, and crystallographic factors are some of the factors for the occurrence of caries in teeth as hosts. Posterior teeth have a pit and fissure shape which makes them susceptible to caries because food debris accumulates easily. Teeth with rough surfaces can also create plaque attachment so that dental caries is easy to occur. Minerals as much as 97% including calcium, flour, phosphate, carbonate, 1% water and 2% organic matter are constituents of enamel.

The presence of flour, phosphate, carbonate, and water makes enamel mineralization better. The solubility of enamel is influenced by the density of enamel crystals which depends on the minerals contained. If there are many minerals contained, the denser the enamel crystals so that the enamel will be resistant to caries. Primary teeth are more susceptible to caries because the content of organic matter and water is more than permanent teeth so that the crystallography of primary teeth is not as dense as permanent teeth (Marlindayanti et al., 2022).

2. Plaque (microorganisms)

Plaque is a group of bacteria that grow on the matrix and stick to the layers of unclean teeth. Dental plaque is an important component that causes caries. *S. mutans*, *S. sanguis*, *S. mitis*, and *S. salivary* are gram-positive bacteria that cause caries where *S. mutans* is the main cause of acid-resistant caries because it has acidogenic and aciduric properties (Marlindayanti et al., 2022).

3. Carbohydrate Diet (substrate)

Microorganisms multiply and colonize on the enamel surface influenced by substrates (carbohydrates). Diet affects the caries process locally, especially in terms of the frequency of food consumed. Foods and drinks containing soda that are consumed too much also cause caries. Demineralization takes place 20 to 30 minutes after consuming foods and drinks containing soda, so that microorganisms that cause dental caries in the oral cavity produce acid (Marlindayanti et al., 2022). Factors that cause dental caries in children are cariogenic foods, types of cariogenic foods, cariogenic diet and frequency of consumption of cariogenic foods (Nissa et al., 2021). Cariogenic foods that contain a lot of sugar and are sticky to the surface of the teeth if not cleaned properly can affect the formation of dental caries.

Sugar and sucrose type food consumption patterns increase the speed of dental caries, especially in children who often consume these sweet foods. The influence of food patterns in the caries process is usually local, especially in the frequency of consuming food. Every time someone consumes food and drinks containing carbohydrates, acid will be produced by several bacteria that cause caries in the oral cavity so that demineralization occurs which lasts for 20-30 minutes after eating

(Farizah et al., 2021). Consuming cariogenic and acidogenic snacks 3 times a day or more over a long period of time can increase the risk of caries. Sugar in snacks can reduce the pH in the plaque, if the higher the frequency of consumption of cariogenic snacks, the higher the decrease in pH in the plaque (Aprinta et al., 2018).

#### 4. Time

Elianora (2020) says that cavities can form in a period of time that varies from 6 to 48 months. Caries develops in the human oral cavity takes several months or years because in the oral cavity there is saliva which has buffer properties so that caries does not destroy teeth in a matter of days. Caries can be stopped if detected early. According to Marlindayanti et al., (2022) the buffer properties of saliva help increase plaque pH when food is present and clean carbohydrates and acids from plaque. Not only changes in plaque pH and demineralization of enamel cause caries, but exposure to acids in cariogenic plaque defeats the ability of saliva containing Ca and phosphate ions to increase plaque pH to remineralize. As a result, the balance of HA (Hydroxyapatite) changes and the local pH becomes very acidic. The beginning of the caries process is a white spot, enamel surface lesion, and demineralization. In severe caries dentin and cementum will be damaged.

#### *Stunting dan Karies*

Purnamasari *et al* (2022) stated that stunting is a condition where the height or length of a toddler's body is below normal for his age based on WHO length or height measurements, which is less than the standard deviation (SD). According to a study conducted by Salma *et al* (2022) stunting is a long-term nutritional problem caused by insufficient nutritional intake for infants and fetuses during the first thousand days of their lives, which can lead to fetal death. Moksini *et al* (2022) said stunting can occur due to lack of nutritional intake over a long period of time. Stunting is usually only seen after the baby is two years old even though the lack of nutritional intake has occurred since the baby is in the womb and early after the baby is born.

Stunting is an indicator of chronic malnutrition that affects various body systems, including oral growth and development, as well as various dental diseases and disorders. Adequate nutrition plays an important role in the development and protection of oral health (Renggli *et al.*, 2021). Micronutrient, protein and vitamin deficiencies in malnourished children can cause abnormalities in the oral cavity. Dental development in the pre-eruption phase is influenced by nutritional status (Vieira *et al.*, 2020).

Caries-related malnutrition can occur in early childhood through mechanisms such as enamel hypoplasia and hyposalivation (Setiawan *et al.*, 2022). *Severe Early Childhood Caries* (S-ECC) is associated with iron deficiency anemia which reduces salivary flow, and deficiencies in vitamin D, vitamin A, calcium and albumin can cause enamel hypoplasia/hypomineralization, as well as loss of the protective effects of iron, vitamins and zinc/zinc for teeth. Iron, calcium and albumin deficiencies and protein energy malnutrition can cause enamel defects that make the enamel surface rough and vulnerable to plaque

accumulation and facilitate attachment and accelerate the formation of bacterial colonization, especially *Streptococcus mutans* bacteria and other bacteria that play a role in the caries process (Folayan, 2019).

According to Damayanti (2016) calcium deficiency will affect linear growth if the calcium content in the bones is less than 50% of the normal content. Calcium forms complex bonds with phosphates that can provide strength to bones, so phosphorus deficiency can interfere with growth. Lack of calcium and phosphorus deposits can lead to growth retardation. Calcium and phosphorus deposit in the organic matrix in the form of hydroxyapatite crystals during the mineralization process and provide strength to the bone.

Malnutrition can also cause salivary gland hypofunction, with decreased salivary flow rate and *buffering* capacity, as well as changes in the ratio of salivary enzyme constituents, especially amylase, lysozyme, and immunoglobulins. These changes can increase the risk of higher caries (Folayan, 2020).

### *Toddlers*

Toddlers are a group of children aged 0 to 5 years. The process of human growth and development is an important period, especially in the rapid growth and development of toddlers (Akbar *et al.*, 2020). Salamah (2021) said that toddlers aged 0-59 months need a greater amount of nutrition because of their rapid growth and development process. Under-fives are prone to deficiencies in essential nutrients and nutritional disorders. Children's food consumption affects their nutritional status as food plays an important role in their physical growth and intelligence.

According to the *World Health Organization* (WHO) toddlers are children aged 0-60 months. The age of toddlers can be grouped into three categories, namely the infant group aged 0-2 years, the toddler group aged 2-3 years and the preschool group aged >3-5 years (Nasution and Susilawati, 2022). According to the Ministry of Health (2025) under-fives are the period after birth until before the age of 59 months which is grouped into newborns aged 0 to 8 days, infants aged 0 to 11 months and toddlers aged 12 to 59 months.

## **METHODOLOGY**

This study used a qualitative approach with a case study design to explore in depth the relationship between stunting and dental caries in children under 24-59 months of age in Jember District. This approach was chosen because it allows researchers to understand contextually and holistically the experiences, perceptions, and practices of parents and health workers in dealing with both problems in their daily environment. This type of research is descriptive qualitative with an intrinsic case study design, with the research focus directed at one typical case, namely a community or area in Jember with a high prevalence of stunting and dental caries. Intrinsic case studies are used to explore internally interesting phenomena, not solely for generalization, but for a deep understanding of a particular case.

The study was conducted in several villages in Jember Regency that have high rates of stunting and dental caries in toddlers, based on data from the local Health Office. The study subjects consisted of parents or primary caregivers of

children aged 24-59 months, health workers such as dentists, midwives, or nutrition officers of Puskesmas, Posyandu cadres or relevant community leaders. Subjects were selected by purposive sampling by considering their direct involvement in parenting practices, nutrition maintenance, and children's dental health. Data collection techniques used were participatory observation, in-depth interviews, and documentation.

In this study, data analysis was conducted thematically qualitatively based on the approach of Miles and Huberman (1994), which consists of three main stages: data reduction, data presentation, and conclusion drawing/verification. Data reduction was carried out by selecting, simplifying, and focusing information from interviews, observations, and documentation into the form of data relevant to the research focus, namely the relationship between stunting and dental caries. After that, the data was presented in the form of descriptive narratives and thematic matrices to identify patterns, trends, and relationships between themes. To ensure the validity of the data, source and method triangulation techniques (interviews, observations, and documentation), member check to informants to verify the findings, and audit trail in the form of transparent research process records were used to ensure the consistency and credibility of the research results.

## **RESEARCH RESULT**

In an in-depth interview with one mother of a toddler in Summersari Village, it was revealed that she did not understand that chronic malnutrition could impact her child's dental growth. She mentioned that since her child was one year old, his teeth began to show cavities but he was never taken to the dentist because he considered it unimportant. In addition, the mother admitted that she only fed her child simple food, such as rice with salt or instant noodles, due to the family's economic constraints. Ignorance and poverty are the main causes of her child's poor nutritional status and dental health.

In the Patrang area, a posyandu cadre stated that most parents do not attend nutrition counseling regularly, even though it is available. Many mothers prefer to work in the fields or trade rather than come to the posyandu because it is considered to provide no immediate economic benefit. This leaves them unaware of the importance of animal protein, milk and other nutritious foods in the formation of bones and teeth. As a result, many children show signs of stunting as well as having decayed teeth before the age of 4.

A village midwife in Ajung sub-district revealed that most of the stunted children also showed characteristics of poor dental health, such as yellowish teeth color, gums that bleed easily, and holes in the front molars. She explained that although basic immunization is complete, nutrition and diet issues are not well addressed. According to her observations, the habit of giving sweet tea and biscuits as the main food for toddlers is very common among rural communities. In fact, these foods are high in sugar and low in nutrients, are very risky for caries and do not support optimal growth.

In Panti Village, a housewife admitted that she had never brushed her children's teeth because she was not used to doing so since childhood. She said

that she herself did not brush her teeth twice a day, so she did not feel it was important to teach her children. She thought that dental caries in toddlers is a normal thing that will disappear when the milk teeth fall out. This ignorance caused her child to have severe cavities, even to the point of having swollen gums and difficulty eating.

From the results of focus group discussions (FGDs) with mothers of toddlers in Kaliwates Sub-district, it was found that most mothers were unaware of the relationship between diet, nutrition and dental health. They only consider stunting as a height problem, without understanding that micronutrient deficiencies can lead to weak tooth enamel formation. Many believe that as long as the child looks active and does not get sick often, then they are healthy, even if their teeth have cavities and grow short. This paradigm is a big challenge in health education and intervention efforts.

One of the dentists at the Arjasa Community Health Center said that he often receives toddler patients with badly damaged teeth, even before the age of 3 years. When asked the parents, most admitted that they had never taken their children to the dentist before, because they did not know that such a small child needed a dental check-up. She emphasized that tooth decay in toddlers often starts from the habit of sleeping while drinking milk or sweet tea, then not cleaning. This points to the need for dental health education programs that start as early as pregnancy.

In interviews with PAUD teachers in the Wuluhan area, it was found that children with stunting and dental caries tend to have difficulty concentrating in class. They often complained of toothaches or seemed unenergetic during learning and play activities. The teacher mentioned that these children rarely bring nutritious food and more often consume sugary snacks in the school environment. This situation shows the link between children's physical health, nutritional intake and cognitive ability.

A district health officer noted that areas with the highest stunting rates also tend to have the lowest rates of dental visits. She explained that the allocation for child dental health programs is still very limited and has not been a top priority in regional stunting prevention programs. Many programs focus on nutrition counseling and supplementary feeding, but ignore aspects of dental hygiene and care. This makes intervention efforts less comprehensive and has limited impact.

Field observations in several homes show that access to clean water is still a major problem, especially in the peripheral areas of Silo Sub-district. Many families use unfit river or well water for personal hygiene, including for brushing teeth. Children often wash their mouths with only makeshift water without soap or toothpaste. These environmental conditions amplify the risk of infection and exacerbate existing caries conditions.

In some homes, it was found that toddlers are still given pacifiers filled with sweet tea or condensed milk to soothe them before bed. Parents assume that this method makes children sleep faster and less fussy, despite not knowing the long-term impact on dental health. Some mothers even give sugary drinks more than three times a day without brushing their children's teeth afterwards. This habit is very dangerous, especially for children who are already malnourished.

An interview with a local community leader revealed that there is no regulation or active campaign at the village level on the importance of children's dental hygiene. He mentioned that posyandu activities are more focused on measuring weight and height, without education about dental health. In fact, the community highly respects village leaders and will respond positively if there is an appeal or education from local leaders. This shows the huge untapped potential to encourage healthy living behavior.

Some parents claimed to have received supplementary food assistance from the posyandu, but did not understand how to serve it properly or the balanced food combination. They often mix the fortified porridge with water or instant food, so the nutritional content is not maximally absorbed. This shows that education is not only about delivery, but also about the practice of utilizing nutrition assistance. Without proper education, nutrition interventions are ineffective in preventing stunting and maintaining dental health.

During a visit to elementary schools in the suburbs of Jember, several teachers revealed that children with cavities often lack confidence and are reluctant to speak in front of the class. The pain of chewing also makes them choose not to eat during recess, compromising their daily energy intake. This worsens nutritional status and reinforces the cycle of energy deficiency and infection. The link between dental health and children's socio-emotional development becomes very clear from these observations.

Health workers at the Sukorambi Health Center said that most parents do not know that the growth of children's teeth begins in the womb. Therefore, the nutritional intake of pregnant women is very important in the formation of strong and healthy fetal teeth. Unfortunately, many pregnant women in the area do not get enough calcium and vitamin intake, and never have regular prenatal check-ups. This explains why most children born to mothers with poor nutritional status also experience early dental problems.

Overall, qualitative data from the field showed that social, economic, knowledge, habits and environmental factors strongly influence the relationship between stunting and dental caries in children under five. Parental ignorance, limited access to services, and poor sanitation were the dominant factors in the observed cases. An interdisciplinary approach involving health workers, educators, community leaders and village governments is needed to systematically change this situation. Only by synergizing across sectors can stunting and caries prevention efforts be implemented in a sustainable and comprehensive manner.

The research findings show that there is a close relationship between the incidence of stunting and dental caries in toddlers aged 24-59 months in Jember Regency. Stunted toddlers tend to have higher levels of caries, which is characterized by severe tooth decay, brittle enamel, and more frequent complaints of toothache. Clinically, this is due to disruptions in the dental mineralization process due to chronic nutritional deficiencies, especially calcium, phosphorus and vitamin D which are important for the formation of dental hard tissues. In addition, stunted toddlers generally come from families with low socioeconomic status, which results in a monotonous and low-protein diet, as

well as poor dental hygiene practices due to lack of education and access to adequate dental health services. The habit of consuming high-sugar foods such as sweet tea, biscuits and sweetened condensed milk without the practice of regular brushing also exacerbates caries conditions, making stunting and tooth decay two problems that are interrelated and reinforce each other.

Furthermore, interviews with parents and health workers in the field revealed that many families are unaware of the relationship between poor nutrition and children's dental health. The community paradigm still assumes that decayed baby teeth are not a serious problem because they will fall out on their own, even though the condition can affect the child's ability to eat, speak, and even overall cognitive growth. Field observations also show that in areas with high stunting rates, the number of visits to dental health services is very low, and there is no integrated program that simultaneously addresses nutrition and dental health of children under five. These findings emphasize the importance of cross-sector interventions that integrate efforts to improve child nutrition with dental health education and services from an early age, so that stunting prevention not only has an impact on height growth, but also on improving the overall quality of life of children.

## **DISCUSSION**

Stunting as a form of chronic malnutrition causes disruptions in the formation of the body's hard structures, including teeth, due to a lack of calcium, phosphate, and vitamin D intake during critical periods of growth. These micronutrient deficiencies trigger the formation of brittle tooth enamel and delayed tooth eruption, making children more susceptible to caries (Pitasari, Kartika, & Damayanti, 2023). In the context of Jember, many stunted children under five show poor dental quality due to inadequate nutrition in the womb. This reinforces the importance of early nutritional detection to prevent long-term dental health complications.

Dental caries in toddlers often worsen stunting conditions because pain while eating can reduce the intake of nutrients needed for optimal growth. According to Aulia, Kusuma, & Setiawan (2023), caries causes children to prefer soft foods that are generally high in sugar and low in nutrients, exacerbating malnutrition. This reciprocal relationship suggests that caries prevention should be part of stunting interventions. When oral health improves, children's eating function improves, supporting nutritional recovery.

Studies show that children from low-income families have limited access to dental care, and tend to experience stunting and caries simultaneously. Kiswaluyo, Wulandari, & Salma (2023) found that low parental education in Jember Regency was strongly correlated with a lack of understanding of the importance of routine tooth brushing in children. This situation creates a cycle of ignorance and neglect of this important aspect of child development. Therefore, family health education efforts are crucial in breaking the chain of stunting and dental caries.

Puskesmas as basic health service providers in Jember have not integrated dental examinations as part of stunting treatment, even though stunted children

have a higher risk of caries. Aldilawati, Nurulita, & Syam (2023) mentioned that the fragmented health care system is a major obstacle in identifying children with this double risk. Therefore, an integrative approach through the posyandu program that includes oral hygiene education and dental screening of children is needed. This intervention can be done through cadre training and strengthening collaboration between dental and nutrition health workers.

Lack of habituation to brushing teeth from an early age in stunted children is a major risk factor in increasing caries rates. Sari, Handayani, & Lestari (2022) noted that most children with poor nutritional status do not brush their teeth properly or regularly. This factor is exacerbated by the lack of parental or caregiver supervision, especially in families with low socioeconomic conditions. As a result, children experience faster demineralization of tooth enamel, making teeth more brittle and prone to cavities.

Posyandu cadres have a strategic position in providing information and supervision of the dental health of children under five, especially those who are stunted. Active involvement of cadres in dental monitoring and counseling on proper oral hygiene practices has been shown to reduce caries prevalence in several study areas. In the context of Jember, cadres can be the spearhead in bridging limited access to dental health facilities (Yohana, Hartati, & Prasetya, 2022). This kind of community empowerment is needed to reach the most vulnerable layers of society.

Dental caries in stunted children not only causes physical impairment, but also impacts on children's self-confidence and socialization skills. Children with severely damaged teeth often feel embarrassed to speak or smile, thus interfering with their social interactions in the play environment or early education. This psychosocial disruption can worsen children's quality of life in the long term and should be a concern in the holistic management of stunting (Setiawan, Nuraini, & Wijaya, 2022). Good oral health is an important part of a child's psychological well-being.

Local governments need to build collaboration between health, education, and community organizations to run dental prevention and stunting prevention programs simultaneously. For example, the integration of the "Healthy School" program with the training of PAUD teachers and health cadres in recognizing the early signs of stunting and caries. This collaboration will result in more effective interventions and can reach children in the golden age evenly (Andriyani, Rahmah, & Widodo, 2021). Cross-sector synergy is a key pillar in the community-based prevention approach.

The results of the analysis show that there is a close relationship between stunting and the high prevalence of dental caries among children under 24-59 months of age in Jember Regency. Children who are stunted tend to have tooth structures that are more susceptible to damage due to chronic nutritional deficiencies, especially those related to vitamin D, calcium, and protein which play an important role in the formation of dental hard tissue. The study by Fitriyani et al. (2020) reinforced these findings by showing that stunted toddlers had higher DMFT scores than children with normal nutritional status, indicating that malnutrition not only impacts height growth but also oral health. Therefore,

efforts to improve nutrition during the golden period of child growth should be combined with early dental health education and care as a form of comprehensive dual intervention.

Low socioeconomic conditions, limited access to health services, and low levels of parental education are the main external factors that exacerbate the relationship between stunting and caries in toddlers. Children from low-income families are less likely to receive adequate dental care and correct information about the importance of oral hygiene. Research by Wulandari et al. (2021) states that toddlers from low-income families are twice as likely to experience caries than children from families with middle to upper income. This confirms the need for integration of family and community-based intervention programs such as posyandu and PAUD to prevent stunting while increasing dental health awareness.

The strategy to address stunting, which has so far only focused on aspects of linear growth, needs to be expanded by considering aspects of oral health as an integral part of child development. Nutritional interventions that are not accompanied by proper dental care risk failing to improve the overall quality of life of children. A recent study by Hidayati and Sari (2022) showed that the success of stunting prevention programs would be more optimal if accompanied by dental health checks and education at the family and school levels. Thus, cross-sectoral integration between health, education, and primary dental services needs to be strengthened to tackle these two health problems simultaneously and sustainably.

## **CONCLUSIONS AND RECOMMENDATIONS**

This research highlights a clear and concerning link between stunting and dental caries among toddlers aged 24-59 months in Jember District. Stunted children, whose growth has been chronically impaired due to prolonged nutritional deficiencies, are shown to be more vulnerable to dental problems-not only because their teeth may form less perfectly, but also because they often grow up in environments where oral hygiene is neglected. These children are at a double disadvantage: they face physical vulnerabilities from poor nutrition and social disadvantages from limited access to dental care and health education. The results call for a more holistic, integrated approach where efforts to improve child nutrition go hand in hand with promoting good oral health practices at the family and community levels, particularly through strengthened primary health services and educational outreach

Based on the findings of this study, it is recommended that stunting prevention efforts in children under 24-59 months of age in Jember District be integrated with dental caries prevention programs through a holistic primary health care approach. This integration includes routine dental check-ups at Posyandu, nutrition and oral hygiene education for parents, and the provision of nutritional supplements that support children's growth and dental health. In addition, there is a need for cross-sector collaboration between health, education and village government agencies in designing community-based interventions that are sustainable and responsive to local socio-economic conditions. Policy support and adequate budget allocations are essential for this program to run

effectively and have a real impact on improving the overall quality of life of children.

### ADVANCED RESEARCH

Advanced research should focus on exploring the biological and social mechanisms that link stunting with susceptibility to dental caries through a multidisciplinary approach. Further research could incorporate biomolecular analysis of stunted children's tooth enamel to determine the effect of specific micronutrient deficiencies such as calcium, phosphate and vitamin D on the quality of tooth mineralization. In addition, a longitudinal approach is essential to monitor the development of children's nutritional status and dental health simultaneously over a period of time to see the long-term impact of integrated interventions. Follow-up studies should also include community-based intervention models that test the effectiveness of collaboration between the health, education and local government sectors in preventing stunting and caries simultaneously in early childhood in high-prevalence areas.

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